Abstract Submitted to the
International Conference on Strongly Correlated Electron Systems
University of Michigan, Ann Arbor
August 6-10, 2001

Structure of orbital polaron in ferromagnetic $LaMnO_3$

Jan Bała[1], Andrzej M. Oleś[1], Peter Horsch[2]

[1] *Institute of Physics, Jagellonian Univ., Reymonta 4, PL-30059 Kraków, Poland*
[2] *Max-Planck-Institut FKF, Heisenbergstrasse 1, D-70569 Stuttgart, Germany*

We investigate the spectral functions and various orbital correlation functions relative to the position of an e_g hole moving in the ferromagnetic plane of orbitally ordered $LaMnO_3$. Including the effect of the Jahn-Teller interactions [1] and polarization of orbitals in the vicinity of the hole, as well as the superexchange orbital interaction $\propto J$ due to e_g excitations and the hole kinetic energy $\propto t$, we solve the problem in a self-consistent Born approximation [2]. We report a large redistribution of the spectral weight in comparison with the free hole dispersion ($\sim t$) which depends strongly on the type of the alternating orbital order stabilized by the superexchange. The coupling of the hole to the lattice degrees of freedom leads to a substantial change in the spectral functions and the dispersion of the low-energy quasiparticle band. The shape of the orbital polaron is strongly influenced by the strength of the orbital polarization term $\propto \Delta$, resulting in the formation of small orbital polarons in the limit of $\Delta \ll t$, characterized by orbital reorientations mainly on nearest neighbours to the hole. Decreasing superexchange J increases the number of orbital excitations around the hole, with the polaron either increasing its size (at $t \neq 0$), or being constrained to neighboring Mn^{3+} ions with strong polarization of orbitals (at $t = 0$ and $\Delta \neq 0$).

[1] J. Bała and A. M. Oleś, Phys. Rev. B **62**, R6085 (2000).
[2] J. van den Brink, P. Horsch, and A. M. Oleś, Phys. Rev. Lett. **85**, 5174 (2000).